168

**TRC**

*Customer-Focused Solutions*

# ADDITIONAL OFFSITE GROUND WATER RCRA FACILITY INVESTIGATION WORKPLAN

## FORMER INTERNATIONAL LIGHT METALS FACILITY TORRANCE, CALIFORNIA

*Prepared for*

**Lockheed Martin Corporation**

Burbank, California

*Prepared by*

**TRC**

Irvine, California

September 2000

**TRC**

*Customer-Focused Solutions*

# ADDITIONAL OFFSITE GROUND WATER RCRA FACILITY INVESTIGATION WORKPLAN

## FORMER INTERNATIONAL LIGHT METALS FACILITY TORRANCE, CALIFORNIA

*Prepared for*

**Lockheed Martin Corporation**

Burbank, California

*Prepared by*

**TRC**

Irvine, California

Project No. 99-200

September 2000


TRC
21 Technology Drive
Irvine, California 92618
Telephone (949) 727-9336
Facsimile (949) 727-7399


REGISTERED ENVIRONMENTAL ASSESSOR - II
RONALD V. GIRAUDI
No. 20054
Expires: 2/17/01
STATE OF CALIFORNIA

REGISTERED GEOLOGIST
JEFFREY HENSEL
No. 5759
STATE OF CALIFORNIA

Ronald V. Giraudi, REA II
Project Director

Jeff Hensel, R.G.
Project Geologist

**TRC**

*Customer-Focused Solutions*

September 11, 2000

Project No. 99-200

Ms. Chia-Rin Yen
Hazardous Substances Scientist
Department of Toxic Substances
1011 North Grandview Avenue
Glendale, California 91201

Transmittal
Additional Offsite Ground Water RCRA Facility Investigation Workplan
Former International Light Metals Facility
Torrance, California
(Docket HWCA: P1-98/99-002)

Dear Ms. Yen:

Pursuant to our conversation with Mr. Will Rowe on Tuesday, September 5, 2000, enclosed is a copy of the Additional Offsite Ground Water RCRA Facility Investigation Workplan (Workplan) for the former International Light Metals facility in Torrance, California. A copy of Figure 3.1 from the Workplan was transmitted to Will Rowe on Monday, September 11, 2000. Mr. Rowe reviewed the figure and verbally approved the five direct-push probe locations. We are currently pursuing access approval on these five locations with Boeing Realty Corporation and the new property owners.

Please review the Workplan and contact us with any questions or comments. Once we have your concurrence on the Workplan, we will schedule and implement the work.

Sincerely,

Ronald V. Giraudi, REA II
Project Director

Jeff Hensel, RG 5759
Project Geologist

RVG/JH/GR:rm
Attachments

cc: Yolanda Garza, DTSC
William Rowe, DTSC
Yugal Luthra, DTSC
Hugh Marley, California RWQCB - Los Angeles Region
John Geroch, California RWQCB - Los Angeles Region
Robert McMullen, LMC
Mario Stavale, Boeing Realty Corporation
Steve Shestag, The Boeing Company

# TABLE OF CONTENTS

# TABLE OF CONTENTS
**(Continued)**

## LIST OF FIGURES

# 1.0 INTRODUCTION

## 1.1 INTRODUCTION AND BACKGROUND

1. This Ground Water RCRA Facility Investigation Workplan (Workplan) presents the proposed scope of work for additional offsite investigation activities south and east of the Lockheed Martin Corporation (LMC) former International Light Metals (ILM) facility in Torrance California. This work will be performed pursuant to the Ground Water RCRA Facility Investigation (GWRFI) Corrective Action Consent Agreement between LMC and the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) regarding the former ILM facility.

2. TRC has prepared this Workplan and will implement the work pursuant to its contract with LMC to complete the GWRFI and the remaining ground water consent agreement activities (e.g., corrective measures study, correct measures implementation, etc.)

3. The former ILM facility site comprises approximately 67.4 acres and is located on the southeast corner of 190th Street and Western Avenue in the City of Los Angeles, California. The site location is shown in Figure 1.1.

4. The site was previously an industrial metal processing facility (former ILM facility). Operation began at the site around the beginning of World War II and continued under various ownerships until 1992 when operations were halted. Operations included manufacturing of extruded and forged aluminum and titanium products, and included an aluminum foundry and titanium processing. These former operations are believed to have been the source of contamination, primarily chlorinated volatile organic compounds (VOCs) and heavy metals, to the soil and ground water at the site.

5. The former facilities were demolished and removed in 1995 and 1996. A soil RFI (SRFI) was conducted after closure of the facility. As a result of the SRFI findings, impacted soils were removed and/or remediated at the site in 1996. The SRFI activities are described in the *RCRA Facility Investigation Report,* Martin Marietta Technologies, Inc., International Light Metals Facility, Torrance California, February 26, 1996 by Geraghty & Miller, Inc. A "No Further Action" for Soil Remedy Approval was granted by the DTSC in 1997.

6. The site was purchased by Fremont Associates, Inc., in 1997 and redeveloped. The site is currently occupied by three large and two smaller warehouse/distribution buildings and offices surrounded by parking with minimal landscape areas.

7. Ground water investigations have been ongoing at the site since August 1994. Also, offsite investigations were initiated in early 1999 on the adjacent and downgradient property owned by Boeing Realty Corporation (BRC). GWRFI activities through December 1999 are presented in the *Ground Water RCRA Facility Investigation Report*, Volume I and II, Former International Light Metals Facility, Torrance, California, December 1999, by TRC (GWRFI Report). The limits of ground water impacts in July 1999 for trichloroethene (TCE), tetrachloroethene (PCE) and dissolved hexavalent chromium as presented in the GWRFI Report are shown in Figures 1.2, 1.3 and 1.4, respectively.

8. The DTSC provided comments on the GWRFI report in March 2000 and requested additional investigation activities. In May 2000, TRC submitted responses to the DTSC comments. Based on subsequent meetings between the DTSC and TRC in June 2000, additional offsite ground water investigation activities were proposed by TRC in a letter to the DTSC dated June 28, 2000. The DTSC submitted additional comments in a letter dated July 26, 2000.

9. After additional discussions with the DTSC, TRC prepared the additional offsite investigation workplan described herein.

## 1.2 PURPOSE AND OBJECTIVES

1. The purpose of the investigation activities described in this Workplan is to address concerns regarding the potential horizontal and vertical extent of offsite contaminant migration. Specific locations of concern were identified as the areas east of former offsite Well BL-6, southeast of onsite Wells P-1 and P-20 and offsite Wells DAC-P1 and BL-3, and south of onsite Wells P-7 and P-22 and offsite Well BL-3.

2. The objective of this additional investigation will be to obtain initial ground water samples from two depths within the shallow saturated zone and from one additional depth within the deeper aquifer at the specific locations of concern, downgradient from the former ILM facility. Based on the analytical results of these samples, three additional ground water monitoring wells will be installed in offsite locations and at screened depths which will be the most appropriate for long-term monitoring of downgradient contaminant migration.

# 2.0 GEOLOGY AND HYDROGEOLOGY

## 2.1 GEOLOGY

1. The generalized stratigraphy beneath the Torrance area includes a deep basement of Mesozoic metamorphic rocks, overlain uncomformably by thick sedimentary strata of mostly Miocene and younger age. The Puente Formation and Repetto Formations contain late Miocene to early Pliocene alternating shale, sandy shale, sandstone, and minor micaceous and carbonaceous siltstone. These strata are overlain conformably by the Pico Formation, which contains late Pliocene alternating sands, sandy shales and silts. These are overlain by the Palos Verdes and San Pedro formations, both of which contain loosely consolidated Quaternary sands, gravels and silts, although these two formations contact unconformably. These strata are overlain by the Lakewood formation, containing Quaternary age clays, silts, sands and gravels. Most sediments higher in the sequence (shallower) are nonmarine, and the youngest deposits are floodplain and river-channel deposits (alluvium) that contain semiconsolidated to unconsolidated clays, silts, sands and gravels.

2. Based on the geology of the region and information provided from site boring logs, the material found beneath the former ILM facility consists of unconsolidated sediments which are capped in most places by concrete or asphalt, and occasionally by discontinuous intervals of fill materials either at the surface or beneath the concrete/asphalt cap, (see GWRFI Report). The surface cap conditions are basically consistent for both the former and current operations at the site.

3. The shallow sediments at the site occur as a heterogeneous assemblage of silt, clay and sand. These sediments (excluding fill materials) can be identified in five distinctive layers, described in detail in the GWRFI Report. A low-permeability layer consisting of primarily silts and clays has been encountered from ground surface to an average depth of approximately 25.5 feet beneath the former ILM facility (the "Upper Clay/Silt Unit"). It is underlain by a relatively high-permeability layer consisting primarily of fine-grained sands and silty sands which extends to an average depth of approximately 40 to 45 feet (the "Upper Sand Unit"). Beneath the Upper Sand Unit lies a thin, discontinuous low-permeability zone (the "Lower Clay/Silt Unit") which extends to an average depth of approximately 45 to 50 feet beneath the site. Beneath the "Lower Clay/Silt Unit" lies the "Lower Sand Unit," which consists of permeable sand. Within this sand, the top of the saturated zone occurs at approximately 65 to 70 feet below ground surface (bgs). Underlying this sand layer is the "First Saturated Clay (FS Clay)," a discontinuous layer beneath the former ILM facility found

at depths ranging from 69 to 83 feet bgs. These layers, together with sand to depths of approximately 98 to 108 feet bgs, likely correspond with the Semiperched aquifer and the upper and middle portions of the Bellflower aquiclude hydrologic units as defined by the State of California Department of Water Resources (DWR). These shallow sediments are presented in the site cross section in Figures 2.1 and 2.2, and are discussed further in the following section.

## 2.2 REGIONAL HYDROGEOLOGY

1. The area around the Cities of Torrance and Santa Monica includes the Coastal Plain occurring within the southwestern block of the Los Angeles Basin. The Newport-Inglewood uplift divides the Coastal Plain into two distinct ground water basins, the Central Basin and the West Coast Basin. The former ILM facility site is located in the West Coast Basin, which is on the southwest or seaward side of the Newport-Inglewood uplift. The West Coast Basin extends from the Ballona Escarpment (Playa del Rey) and Baldwin Hills, on the northwest, to the Long Beach Plain, on the southeast. The Torrance Plain is located within the center of the West Coast Basin.

2. Ground water contained in the West Coast Basin occurs in three main water bodies. A "water body" represents a ground water system which includes one or more ground water aquifer(s) and its contained water. In descending order, these main water bodies are: (1) the "Semiperched aquifer water body"; (2) the "principal water body"' and (3) the "saline water body." Based on geologic data presented in DWR Bulletin 104 (DWR, 1961), the "Semiperched aquifer water body" includes the Semiperched aquifer hydrologic unit with depths that correlate with the "Upper Clay/Silt Unit" as defined at the site. Also, the "Upper Sand Unit," "Lower Clay/Silt Unit," "Lower Sand Unit," and "FS Clay" correlates with the upper Bellflower aquiclude. Where the upper portion of the Bellflower aquiclude lacks consistent finer grained units, as with the project site, the transition between the hydrologic units of the Semiperched aquifer and the upper Bellflower aquiclude is not as distinguishable. Below the "Lower Sand Unit" and the "FS Clay" is the lower Bellflower aquiclude. The "principal water body" consists of the Gage aquifer, and other aquifers and aquicludes above the base of the fresh water and is separated from the "Semiperched aquifer water body" by the Bellflower aquiclude." Below the "principal water body" is the "saline water body."

3. The Semiperched aquifer water body consists of shallow, unconfined, and semiperched aquifer water and is typically found in unconsolidated Quaternary sediments less than 100 feet below land surface. The Semiperched aquifer water body has been found to maximum depths of 80 to 100 feet bgs within the south-central part of the Torrance Plain. In general, the Semiperched aquifer water body is of little beneficial use due to its poor water quality and yields little or no water to wells. In many areas of the West Coast Basin, ground water is not detected in sediments of the Semiperched aquifer.

4. The principal water body consists of the fresh water confined in the major aquifers found in the unconsolidated Quaternary sediments and in underlying unconsolidated and semiconsolidated Pliocene sediments. The principal water body extends downward from the base of the Semiperched aquifer water body and Bellflower aquiclude (where present) to the top of the saline water body. The principal water body reaches its maximum thickness near the intersection of Carson and Alameda streets, approximately 5 miles east-southeast of the former ILM facility site. The principal water body is extensively developed and used for water supply across the West Coast Basin.

5. The saline water body consists of saline water contained in the Pico formation and the Monterey shale below the principal water body.

## 2.3 SITE HYDROGEOLOGY

1. Regional and local hydrogeologic data suggest that one semiperched aquifer, one major aquiclude and three principal aquifers occur below the former ILM facility and immediate surrounding area. In descending order, they are the Semiperched aquifer, the Bellflower aquiclude, the Gage aquifer, the Lynwood aquifer, and the Silverado aquifer. The characteristics of the shallower units (the Semiperched aquifer and the Bellflower aquiclude) have been identified in the numerous onsite and offsite ground water well boring logs (see boring logs in Appendix B, GWRFI Report). It appears that the two deep soil borings drilled during the SRFI activities to characterize shallow soils identified the contact between the Bellflower aquiclude and the Gage aquifer (e.g., Deep Borings DB-1 and DB-2; boring logs are also included in Appendix B, GWRFI Report).

2. The following items present a summary of site ground water conditions based on hydrogeologic data collected during the GWRFI. Hydrogeologic data along with graphical presentations of ground water elevations, flow directions and trends is presented in Chapter 4.0, GWRFI Report.

3. The first occurrence of ground water underlying the former ILM facility is found at approximately 65 feet bgs within a unit termed the "Lower Sand." This "Lower Sand" unit has been defined in previous ILM reports as being within the Bellflower aquiclude and appears to correlate with ground water being within the Semiperched aquifer at surrounding sites. Further review of previous reports indicate others may have presented the Semiperched aquifer as being within the Bellflower aquiclude, whereas the DWR Bulletin 104 interprets them as separate units. Based on available information, the first occurrence of ground water underlying the former ILM facility is within the Bellflower aquiclude.

4. Currently the site is covered by warehouse buildings and is paved, with smaller landscaped areas located along the buildings, property lines, and planter areas adjacent to parking areas and driveways. The potential recharge to the shallow water bearing zone within the Bellflower aquiclude from the current landscape areas of the former ILM site is minimal.

5. A majority of ground water recharge and discharge at the site is likely from subsurface inflow and outflow across the projected property lines of the site. Since 1994, the site has had a net recharge resulting in water levels rising an average of 3 feet in the Bellflower aquiclude. (The former ILM facility is located just within an area identified as an "area of rising water levels." The rising levels are a result of the addition of freshwater along the two main injection barriers; the West Coast Basin Barrier and the Dominguez Gap Barrier [DWR, Water Master Service in the West Coast Basin, Los Angeles County, September 1999]).

6. Ground water elevations recorded at the former ILM facility during July 1999 ranged from approximately 8 to 14 feet below mean sea level (approximately 63 to 69 feet bgs). Ground water levels have been rising in the former ILM facility wells, and hydrographs indicate an average increase of approximately 3 feet.

7. The ground water flow direction is generally to the east-southeast at an average hydraulic gradient of 0.003 ft/ft (July 1999). However, variability in the ground water flow direction and gradient exists on the site. In the western portion of the site, the ground water flow direction is to the east. The ground water flow direction transitions to the south going from west to east across the site. This change in flow direction occurs in the northwest corner of the site and trends through the central portion of the site. This transition creates a ground water trough in the piezometric surface in this area.

8. Ground water appears to be mounding in the area around Well P-2, near the northwest corner of the site. The mounding at Well P-2 is likely influenced by the FS Clay layer, which is approximately 2 to 4 feet higher in Well P-2 than encountered in surrounding wells (i.e., P-3, P-9, P-9B, P-11, P-12, P-23 and P-24). This clay layer was encountered just below the piezometric surface, thus likely has an influence on the ground water elevation.

9. Based on aquifer tests performed east of the site by others, the hydraulic conductivity of the shallow water bearing zone ranged from $1.13 \times 10^{-3}$ cm/sec (3.20 ft/day) to $2.22 \times 10^{-2}$ cm/sec (62.83 ft/day). This is consistent with laboratory hydraulic conductivity measurements of samples collected onsite from the sand zone above the water table during SRFI activities (e.g., $1.16 \times 10^{-2}$ cm/sec). Therefore, the ground water velocity (based on the equation: velocity equals the hydraulic conductivity multiplied by the gradient, and the product divided by the effective porosity) would be estimated from 0.023 ft/day (or 8.55 ft/yr) to 0.46 ft/day (or 167.80 ft/yr) (assumes an average current gradient of 0.003 ft/ft and an average porosity of 41 percent based on site data.)

10. Based on the March and July 1999 water elevations in Wells P-16A and P-16C and the difference in the bottom depth of Wells P-16A and P-16C (32 ft), the potential vertical gradient is estimated at 0.003 to 0.004 ft/ft.

# 3.0 PROPOSED ADDITIONAL OFFSITE FIELD INVESTIGATION

## 3.1 APPROACH

1. The offsite field investigation will be performed in a two-phased approach. The first phase will utilize "direct-push" sampling technology to collect ground water samples at multiple depths from areas of concern in downgradient locations. The ground water samples will be analyzed for VOCs and hexavalent chromium. Based on a review of the analytical results with the DTSC, a second phase will be implemented to install three permanent monitoring wells at appropriate downgradient locations and screened depths which would be the most appropriate for long-term monitoring of contaminant migration.

2. The investigation activities will be performed pursuant to the site-specific Quality Assurance Project Plan (QAPP), Project Management Plan (PMP), Data Management Plan (DMP), Sampling and Analysis Plan (SAP), and Health and Safety Plan (H&S Plan) included in the *Ground Water RCRA Facility Investigation Workplan*, dated January 1996 by Geraghty & Miller, Inc., and updates in the *Ground Water RFI Workplan*, dated March 15, 1999 by ARCADIS Geraghty & Miller, Inc.

## 3.2 OFFSITE FIELD INVESTIGATION

### 3.2.1 CPT AND DIRECT-PUSH GROUND WATER SAMPLING (PHASE I)

1. Direct-push technology will be utilized for the first phase to perform cone penetration testing (CPT) and multi-level ground water sampling at offsite locations downgradient of the former ILM facility. Five offsite locations have been selected for performing these investigations. These locations are designated DP-1 through DP-5 and are shown in Figure 3.1, attached. The locations are adjacent to Harborgate and Francisco Street, on existing or former BRC property. The location of DP-1 was selected to investigate the easterly migration of contaminants from west of the Well BL-6 area. The locations of DP-2 and DP-3 were selected to investigate the southeasterly migration of contaminants from the onsite Well P-1 and P-20 and offsite Well DAC-P1 and BL-3 area. The locations of DP-4 and DP-5 were selected to investigate the southerly migration of contaminants from the onsite Well P-7 and P-22 and offsite Well BL-3 area. Prior to probing, each location will be checked for underground utilities as described in Section 3.2.2.

2. At each of these locations, the CPT probe will be advanced using hydraulics from the direct-push rig to first log soil characteristics and identify the more transmissive saturated

zones. The CPT probe will be advanced to a total depth of approximately 160 feet. After logging the soils, the CPT probe will be withdrawn and the rig moved over approximately 3 feet. The direct-push sampler will then be advanced to collect ground water samples at three depths. The actual depths will be determined based on the CPT results which are graphically displayed and recorded on the rig. The first depth will be approximately 65 feet and correspond to the top of the saturated zone in the Bellflower aquiclude. The second depth will be approximately 120 feet and correspond to the bottom of the saturated zone in the Bellflower aquiclude. The third depth would be approximately 160 feet and correspond to the top of the Gage aquifer.

3. There are limitations with the direct-push technology proposed in this additional investigation. These limitations are associated with the physical characteristics of the soils below the site. The presence of dense, consolidated layers greater than a few inches thick with sampler blow counts of approximately 100 per foot or greater will typically prevent the advancement of direct-push tools using either hydraulic or hammer methods. Although this technology can reach depths of 200 feet and greater, maximum depths are site specific and limited by the denser, more consolidated materials.

4. Based on a review of blow counts from boring logs for onsite (former ILM) and offsite (BRC property) wells (presented in Appendix B in the GWRFI Report), and from discussions with technical staff of companies that provide this direct-push technology, some or most of the target depths may not be achievable. The boring logs indicate blow counts approaching or exceeding 100 per foot in zones between 60 to 80 feet bgs in most well locations. It is anticipated that the first target depth (approximately 65 to 70 feet) will likely be achieved; the second target depth (approximately 120 feet) will likely have only a 50 percent probability of being achieved; and the third target depth (approximately 160 feet) will likely not be achieved.

5. Based on these site conditions, a truck-mounted CPT rig with a 25-ton downward hydraulic loading capacity will be utilized. As a contingency for difficulties in achieving the target depths using CPT, the following approach will be utilized in applying the direct-push technology. If the CPT probe can be advanced to the three target depths in a selected location, the rig will be moved over 3 feet and the ground water sample probe advanced to the three target depths, and samples collected. If the CPT probe cannot be advanced to the three target depths, the rig will be relocated 75 to 100 feet laterally along the property boundary adjacent to the street to an alternate location. If the CPT probe can be advanced to

the three target depths in this alternate location, the rig will be moved over 3 feet and the ground water sample probe advanced to the target depths, and samples collected. If the CPT probe cannot be advanced to the three target depths in the alternate location, a second alternate location may be selected, and/or a hollow-stem auger drill rig will be utilized to advance a boring through the refusal zone(s) to allow the CPT to continue to the total depth. Once the CPT has reached the total target depth in a specific location, the rig will be moved over 3 feet and the ground water sample probe advanced to the three target depths, and samples collected. An auger drill rig will be utilized to reach the target sampling depths, if necessary. This procedure will be repeated at each proposed investigation location, as necessary.

6. Due to the presence of confining clay and silt layers in the bottom of the Bellflower aquiclude which separates the shallow ground water above from the Gage aquifer below, auger borings will not be advanced through these confining layers. The borings will be terminated within these layers and the CPT/ground water samples or Hydropunch® will then be advanced into the Gage aquifer.

7. If the direct-push technology approach described above becomes too laborious and time-consuming and/or encounters additional technical difficulties in the field due to the presence of consolidated layers and the total depth desired, the field work may be terminated and other approaches considered. One alternative approach would be to utilize Hydropunch® technology to complete the investigation.

8. Ground water samples will be collected from each target depth through the direct-push sampler tip. The sampler tip contains a stainless steel screen and sample chamber which is closed during pushing and then opened at the target depth by withdrawing (back-pulling) the rod string approximately 1-foot. A clean, small-diameter stainless steel bailer is then lowered through the hollow rod string down into the sample chamber at the bottom, and ground water retrieved by bailing. Four (4) 40-milliliter glass sample vials will be collected for analysis. Sample vials will be immediately sealed, labeled, and placed in plastic bags inside an iced cooler. Samples will be transported to a state-certified laboratory for analysis at the end of each days activities.

9. After a target depth has been sampled, the rod string will be withdrawn and decontaminated along with the sampler tip and bailer. The sampler and bailer will be steam cleaned and decontaminated by washing with a trisodium phosphate solution and rinsing twice with distilled water. Once decontaminated, the sampler tip will be connected to the rod string again, and advanced to the next target depth.

10. Once the target depths at an investigation location have been sampled, the rod string will be removed. During removal, the rod string will be decontaminated. Before moving to the next location, a tremie rod string will then be inserted to the bottom depth of each CPT and sample probe location and the hole pressure grouted to the surface with a high-solids bentonite grout (15 to 20 weight percent). The high-solids bentonite grout is recommended over neat cement for the small diameter holes by the contractors who implement this technology.

11. If augering is utilized to advance the CPT/sampler or Hydropunch®, the borings will be tremie grouted to the surface with a cement slurry (no bentonite).

12. Soil auger cuttings, if generated, will be collected in bins and stored onsite in a location approved by BRC pending analytical results.

13. The CPT and augering contractors will utilize decontamination equipment that will contain the waste rinsate.

3.2.2 MONITORING WELL INSTALLATION AND SAMPLING (PHASE II)

1. The analytical results from the ground water samples collected in the initial investigation (Phase I), will be reviewed with the DTSC. Based on the analytical results, three additional ground water monitoring wells will be installed in the investigation locations at screened depths which would be the most appropriate for long-term monitoring of downgradient contaminant migration.

2. Prior to drilling, well construction permits will be obtained from the City and County of Los Angeles. Also, Underground Service Alert (USA), BRC, and the new property owners will be notified to determine the presence and location of underground utilities in the

investigation areas. A final check will be performed using geophysical techniques, such as ground penetrating radar (GPR). The final well locations will be subject to the results of these underground utility searches.

3. The monitoring well locations will be drilled using 10-inch diameter augers and a truck-mounted hollow-stem auger rig. During drilling, soils will be logged in the field by a geologist (acting under the supervision of a registered geologist). Auger cuttings will also be monitored for potential VOCs by collecting cuttings in plastic bags from each 10 feet of depth and testing the headspace using an organic vapor analyzer (OVA). Field inspections and soil descriptions will be completed on a boring log in accordance with the Unified Soil Classification System (USCS) and will include monitoring well construction details.

4. The monitoring wells will be drilled to target zone depths based on a review of the Phase I ground water analytical data and agreement between DTSC and TRC. Total depths, therefore, may range from approximately 80 to 170 feet. The screened section will extend 10 feet above and 10 feet below the target depth.

5. The monitoring wells will be installed through the hollow-stem auger using a 4-inch diameter casing with flush-threaded joints. The casing will be constructed of PVC. The perforated section of the casing will be slotted using 0.02-inch slots. The annular space between the formation and the slotted casing will be filter packed using No. 3 grade Monterey sand to approximately 2 feet above the top of the perforated zone. A bentonite seal using 1/4-inch Volclay pellets will be placed on top of the sand to a thickness of approximately 3 feet, and the remaining annular space will be sealed with a cement slurry (no bentonite). The top of the well will be completed using a 12-inch diameter aluminum and/or steel, water-tight traffic cover secured in place with concrete. The top of the well casing will be covered with a PVC slip cap. Figure 3.2 shows a typical monitoring well completion diagram.

6. After placement of the filter pack and prior to setting the seal, a surge block will be used to settle the filter pack. Additional sand will then be added, if needed. The surge tools will be properly decontaminated by washing with a trisodium phosphate solution and rinsing twice with distilled water. Augers will be steam cleaned after each well is completed.

7. The steam cleaning and decontamination rinsate, and soil cuttings will be stored in properly labeled and sealed DOT-approved 55-gallons drums and/or storage bins, and will remain onsite in a location approved by BRC until the proper disposal method can be determined based on the analytical results.

8. Subsequent well development activities will include surging and bailing the well 72 hours after installation. The well will be bailed until the pH, temperature, and conductivity stabilize and the turbidity levels drop below 5 NTUs, measured with a turbidity meter or Imhoff cone.

9. A vertical transit survey will be performed to determine the elevation of the newly installed wells. The survey will measure the top of each well casing elevation to the nearest 0.01 foot. Well P-1 on the former ILM facility site will be used as a benchmark for the survey. After surveying, depth to ground water will be measured in the wells using an interface probe, and the data will be used to estimate the ground water table elevation, flow direction, and gradient.

10. After installation and development, the newly installed wells will be left undisturbed for a minimum of 3 days and allowed to recover before purging and sampling. Prior to purging the new monitoring wells, the depth to fluid measurements will be collected. The wells will be purged using a stainless steel bailer or pump until a minimum of three casing volumes have been removed and pH, temperature and conductivity values have stabilized and turbidity levels drop below 5 NTUs. The purged ground water will be collected in 55-gallon drums and stored in a location approved by BRC pending receipt of analytical results.

11. After purging, samples will be collected from the wells using a disposable PVC bailer. The samples will be placed in 40-milliliter (ml) glass VOA vials and 1-liter bottles, labeled and sealed in plastic bags, immediately placed into an iced cooler, and transported under Chain-of-Custody records to a state-certified laboratory for analysis.

# 4.0 PROPOSED LABORATORY ANALYSIS

1. The ground water samples collected from the direct-push and/or Hydropunch® sampling will be analyzed for VOCs and dissolved hexavalent chromium by EPA Methods 8260 and 7196, respectively.

2. The ground water samples collected from the new monitoring wells will be analyzed for VOCs and dissolved metals by EPA Methods 8260 and 6010/7000 series, respectively.

3. The steam cleaning/decontamination rinsate and purge water, and soil cuttings will be sampled and analyzed for VOCs and dissolved metals (liquids)/total metals (soils) by EPA Methods 8260 and 6010/7000 series, respectively. These investigation residual materials will be properly disposed based on the analysis results.

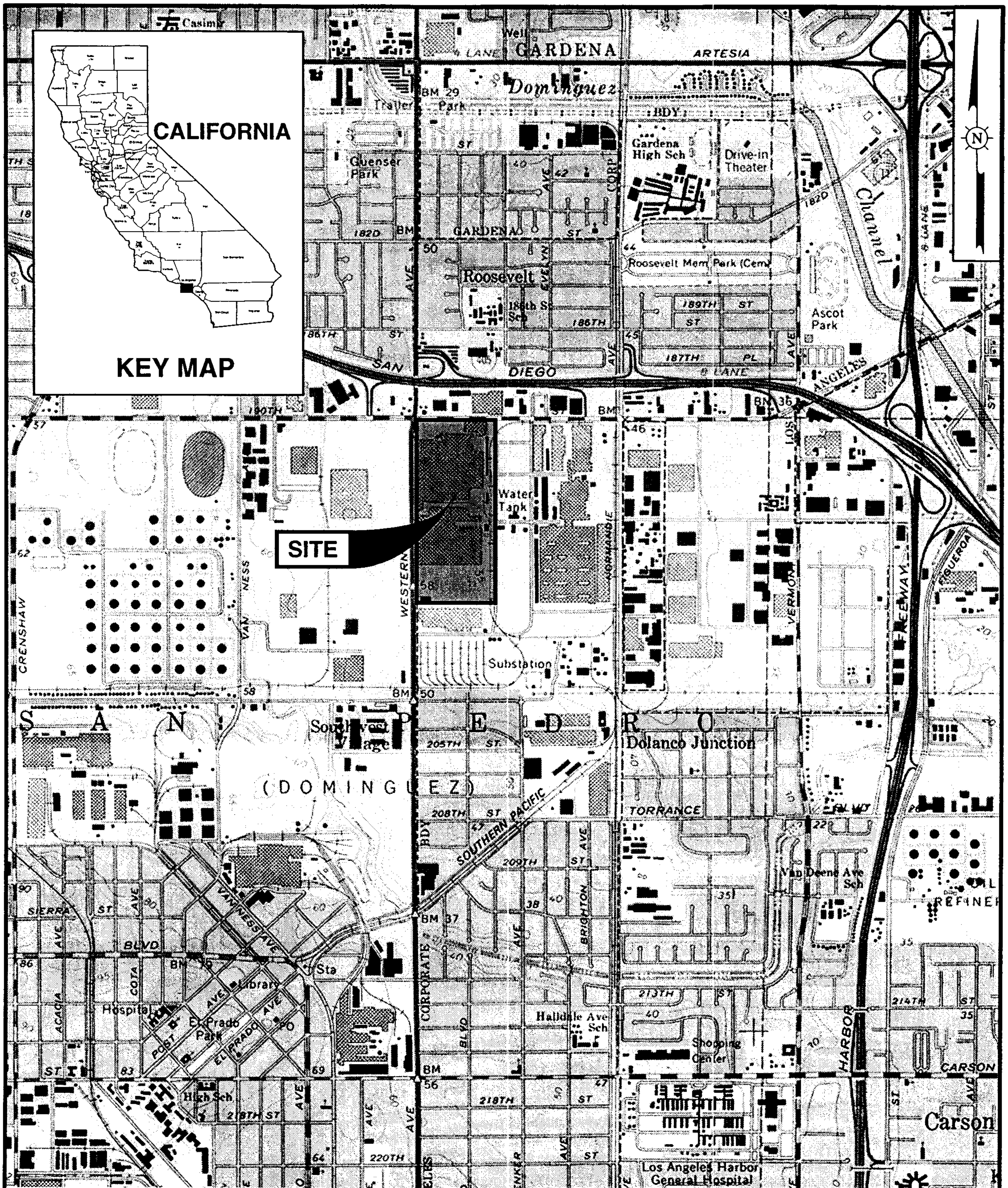
# 5.0 REPORT PREPARATION

1. Following completion of field activities and receipt of laboratory results, a Supplemental GWRFI report will be prepared and submitted to the DTSC. The report will contain a description of the completed work activities, laboratory results, updated analytical tables and figures from the GWRFI Report and findings.

2. Specific topics will include:
   - Background
   - Regional/Site Hydrogeology
   - Field Investigation
     - CPT and Direct-Push Ground Water Sampling Activities
       - Sampling Procedures
       - Field Observations
     - Monitoring Well Construction Activities
   - Laboratory Results
     - Updated Analytical Tables from GWRFI Report
     - Laboratory Report and Chain-of-Custody Records
     - Plume Definition (updated figures from GWRFI Report)
   - Findings

# FIGURES

99-200RFIAI-01 REV.07/14/00




0 2,000 4,000 FEET

SCALE

NOTE: USGS MAP SHOWS FORMER ILM FACILITY STRUCTURES.

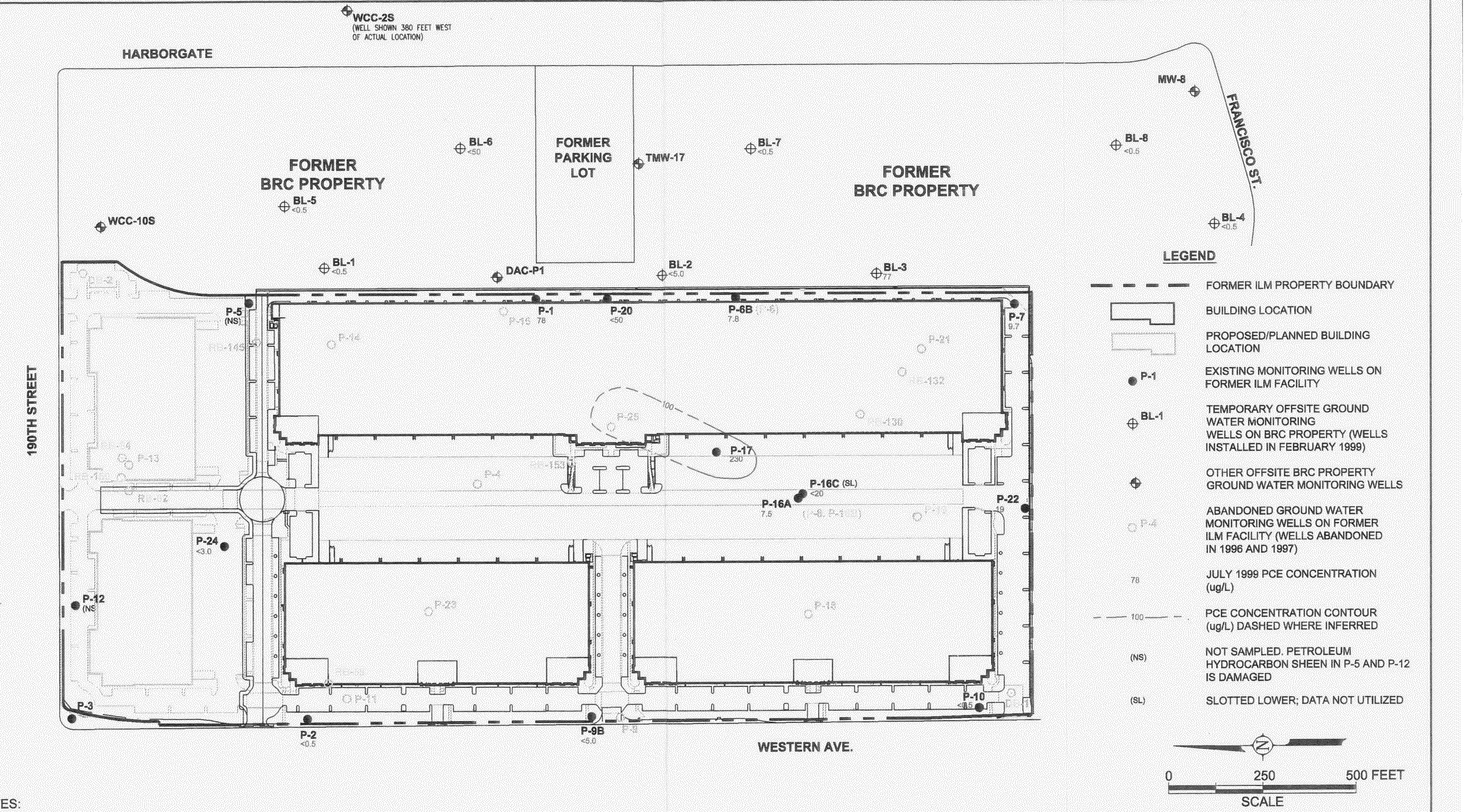
REFERENCE: USGS TORRANCE QUAD, 1981.

**SITE LOCATION MAP**

FORMER INTERNATIONAL LIGHT METALS FACILITY
TORRANCE, CALIFORNIA

| | |
|---|---|
| TRC | FIGURE 1.1 |

BOE-C6-0106783




NOTES:

1. FIGURE SHOWS STATUS OF WELLS (e.g. EXISTING OR ABANDONED) AS OF NOVEMBER 1999. FORMER WELL P-6 WAS LOCATED AT THE PRESENT P-6B LOCATION. FORMER WELLS P-8 AND P-16B WERE LOCATED AT THE PRESENT P-16A AND P-16C LOCATIONS.

2. PROJECTED CONCENTRATION CONTOURS AROUND ABANDONED WELL P-25 BASED ON HISTORICAL DATA TRENDS.

SOURCE: FREEMONT ASSOCIATES, INC. / HILL PINCKERT ARCHITECTS BUILDING PLAN, AUGUST 1999.

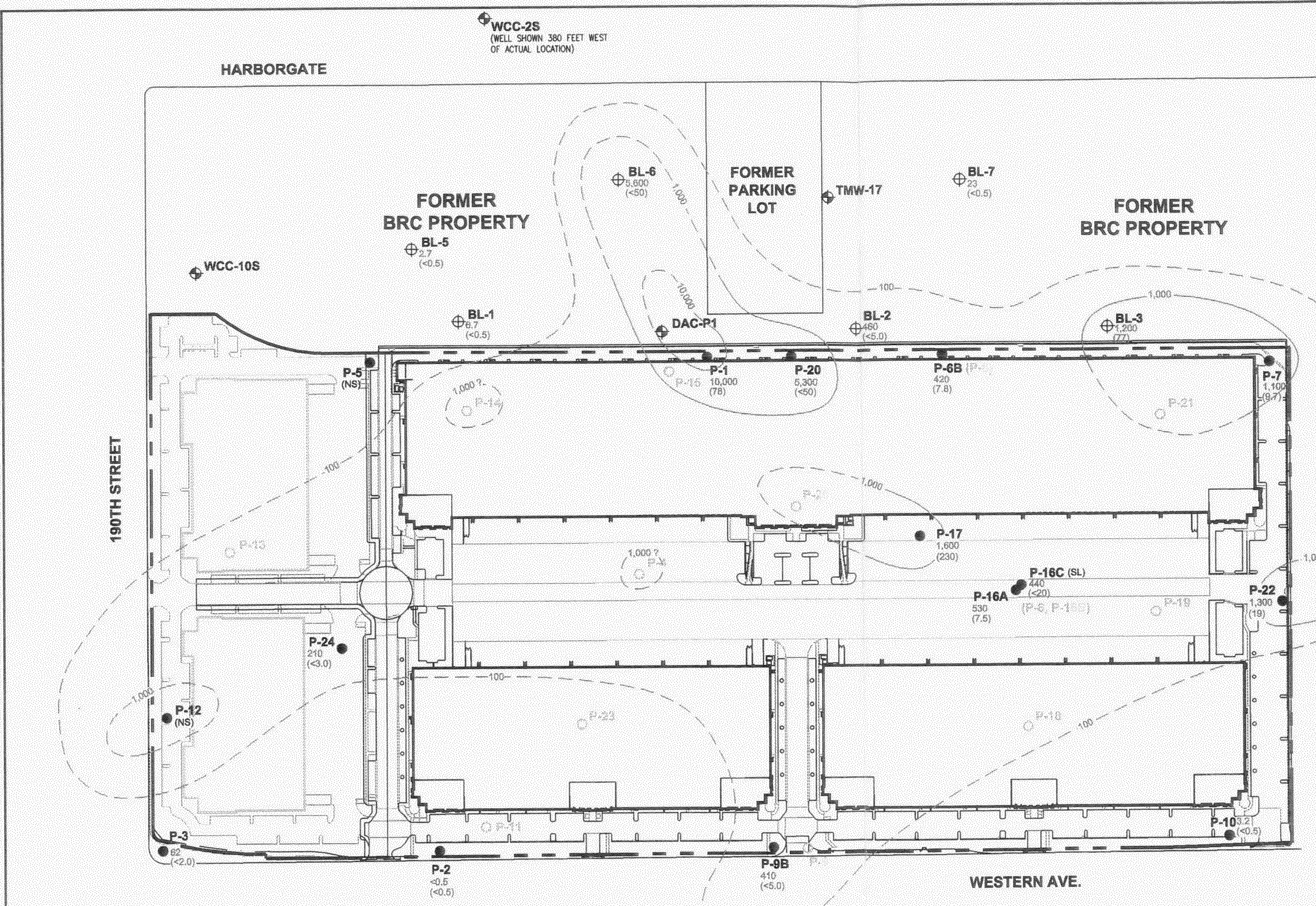
**PCE IN GROUND WATER**
**JULY 1999**

FORMER INTERNATIONAL LIGHT METALS FACILITY
TORRANCE, CALIFORNIA

TRC | FIGURE 1.3

99-200RFIAI-05 REV. 9/11/2000

BOE-C6-0106784




NOTES:

1. FIGURE SHOWS STATUS OF WELLS (e.g. EXISTING OR ABANDONED) AS OF NOVEMBER 1999. FORMER WELL P-6 WAS LOCATED AT THE PRESENT P-6B LOCATION. FORMER WELLS P-8 AND P-16B WERE LOCATED AT THE PRESENT P-16A AND P-16C LOCATIONS.
2. RESULTS FOR P-20 AND BL-6 ARE AN AVERAGE OF THE SAMPLE AND FIELD DUPLICATE SAMPLE.
3. PROJECTED CONCENTRATION CONTOURS AROUND ABANDONED WELLS BASED ON HISTORICAL DATA TRENDS.

0 250 500 FEET
SCALE

## LEGEND

- FORMER ILM PROPERTY BOUNDARY
- BUILDING LOCATION
- PROPOSED/PLANNED BUILDING LOCATION
- P-1 EXISTING MONITORING WELLS ON FORMER ILM FACILITY
- BL-1 TEMPORARY OFFSITE GROUND WATER MONITORING WELLS ON BRC PROPERTY (WELLS INSTALLED IN FEBRUARY 1999)
- OTHER OFFSITE BRC PROPERTY GROUND WATER MONITORING WELLS
- P-4 ABANDONED GROUND WATER MONITORING WELLS ON FORMER ILM FACILITY (WELLS ABANDONED IN 1996 AND 1997)
- 10,000 (78) JULY 1999 TCE AND PCE (IN PARENTHESIS) CONCENTRATIONS (ug/L)
- 100 TCE CONCENTRATION CONTOUR (ug/L) DASHED WHERE INFERRED
- (NS) NOT SAMPLED. PETROLEUM HYDROCARBON SHEEN IN P-5; AND P-12 WAS DAMAGED
- (SL) SLOTTED LOWER; DATA NOT UTILIZED

SOURCE: FREEMONT ASSOCIATES, INC. / HILL PINCKERT ARCHITECTS BUILDING PLAN, AUGUST 1999.

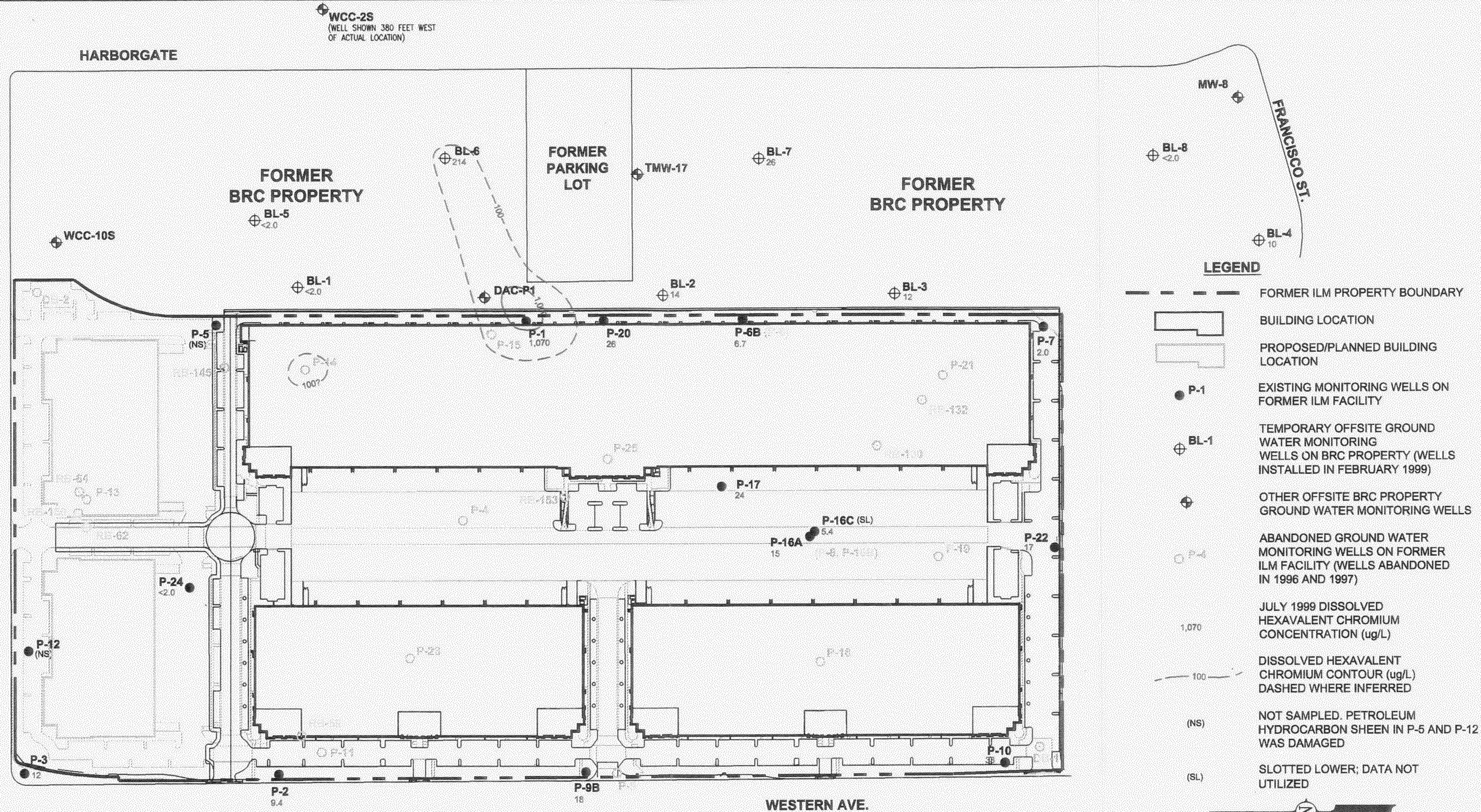
## TCE IN GROUND WATER JULY 1999

FORMER INTERNATIONAL LIGHT METALS FACILITY
TORRANCE, CALIFORNIA

TRC FIGURE 1.2

99-200RFIAI-04 REV. 9/11/2000

BOE-C6-0106785




99-200RFIAI-06 REV. 9/11/2000

NOTES:

1. FIGURE SHOWS STATUS OF WELLS (e.g. EXISTING OR ABANDONED) AS OF NOVEMBER 1999. FORMER WELL P-6 WAS LOCATED AT THE PRESENT P-6B LOCATION. FORMER WELLS P-8 AND P-16B WERE LOCATED AT THE PRESENT P-16A AND P-16C LOCATIONS.
2. RESULT FOR P-20 IS AN AVERAGE OF THE SAMPLE AND FIELD DUPLICATE SAMPLE.
3. PROJECTED CONCENTRATION CONTOURS AROUND ADANDONED WELLS BASED ON HISTORICAL DATA TRENDS.

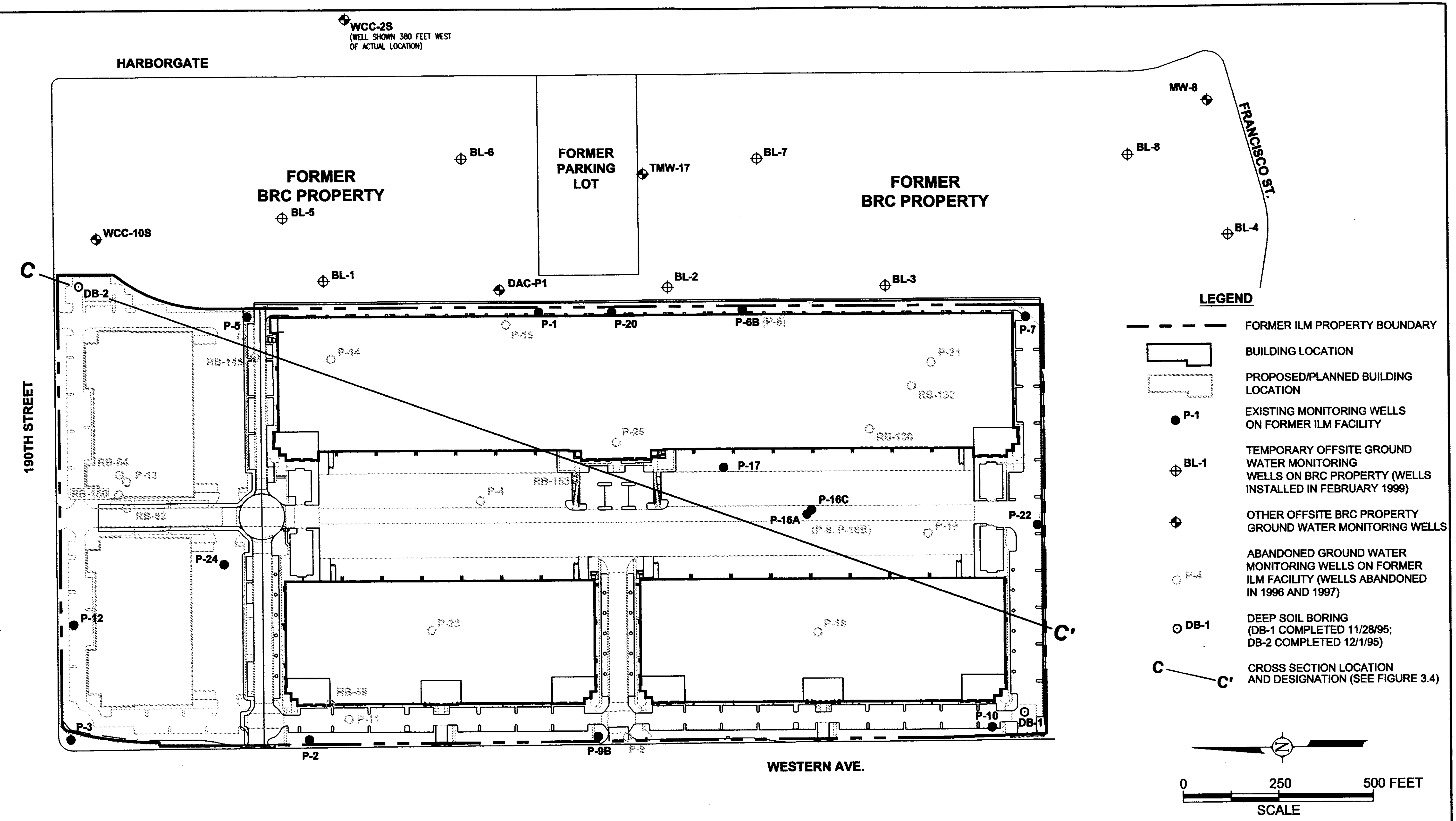
SOURCE: FREEMONT ASSOCIATES, INC. / HILL PINCKERT ARCHITECTS BUILDING PLAN, AUGUST 1999.

**DISSOLVED HEXAVALENT CHROMIUM IN GROUND WATER JULY 1999**

FORMER INTERNATIONAL LIGHT METALS FACILITY
TORRANCE, CALIFORNIA

TRC | FIGURE 1.4

99-200RFIAI-07 REV.9/11/2000




**NOTES:**

1. FIGURE SHOWS STATUS OF WELLS (e.g. EXISTING OR ABANDONED) AS OF NOVEMBER 1999. FORMER WELL P-6 WAS LOCATED AT THE PRESENT P-6B LOCATION. FORMER WELLS P-8 AND P-16B WERE LOCATED AT THE PRESENT P-16A AND P-16C LOCATIONS.

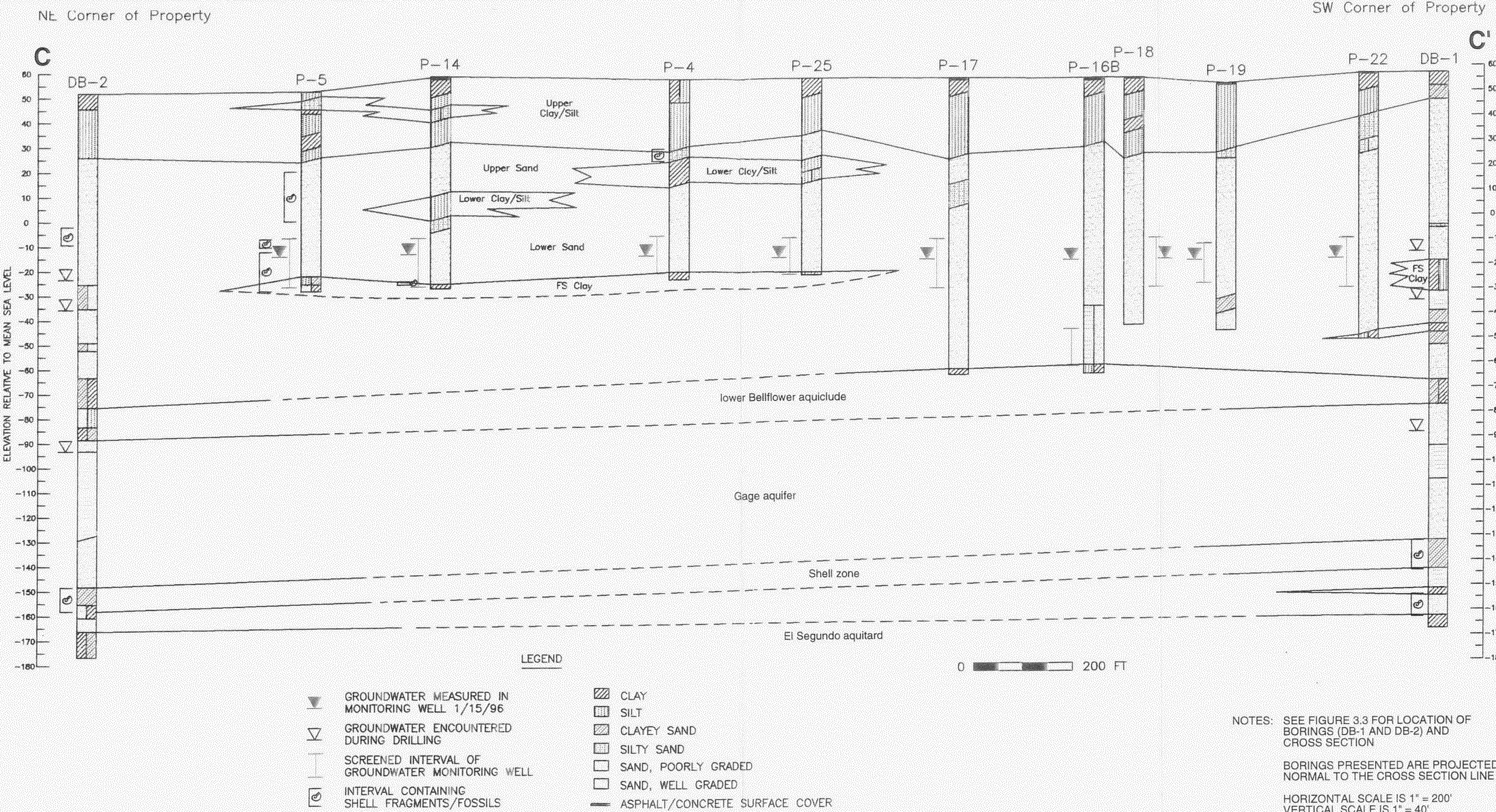
SOURCE: 1. FREEMONT ASSOCIATES, INC. / HILL PINCKERT ARCHITECTS BUILDING PLAN, AUGUST 1999.
2. DRAFT GROUND WATER DATA ASSESSMENT REPORT, RCRA FACILITY INVESTIGATION, LMC, ILM FACILITY, TORRANCE, CA. MAY 7, 1996, FIG. 5.1.

**SITE CROSS SECTION LOCATION MAP**

FORMER INTERNATIONAL LIGHT METALS FACILITY
TORRANCE, CALIFORNIA

TRC | FIGURE 2.1

BOE-C6-0106787




NOTES: SEE FIGURE 3.3 FOR LOCATION OF BORINGS (DB-1 AND DB-2) AND CROSS SECTION

BORINGS PRESENTED ARE PROJECTED NORMAL TO THE CROSS SECTION LINE

HORIZONTAL SCALE IS 1" = 200'
VERTICAL SCALE IS 1" = 40'

VERTICAL EXAGGERATION IS 5 TIMES HORIZONTAL SCALE

**SITE CROSS SECTION**

FORMER INTERNATIONAL LIGHT METALS FACILITY
TORRANCE, CALIFORNIA

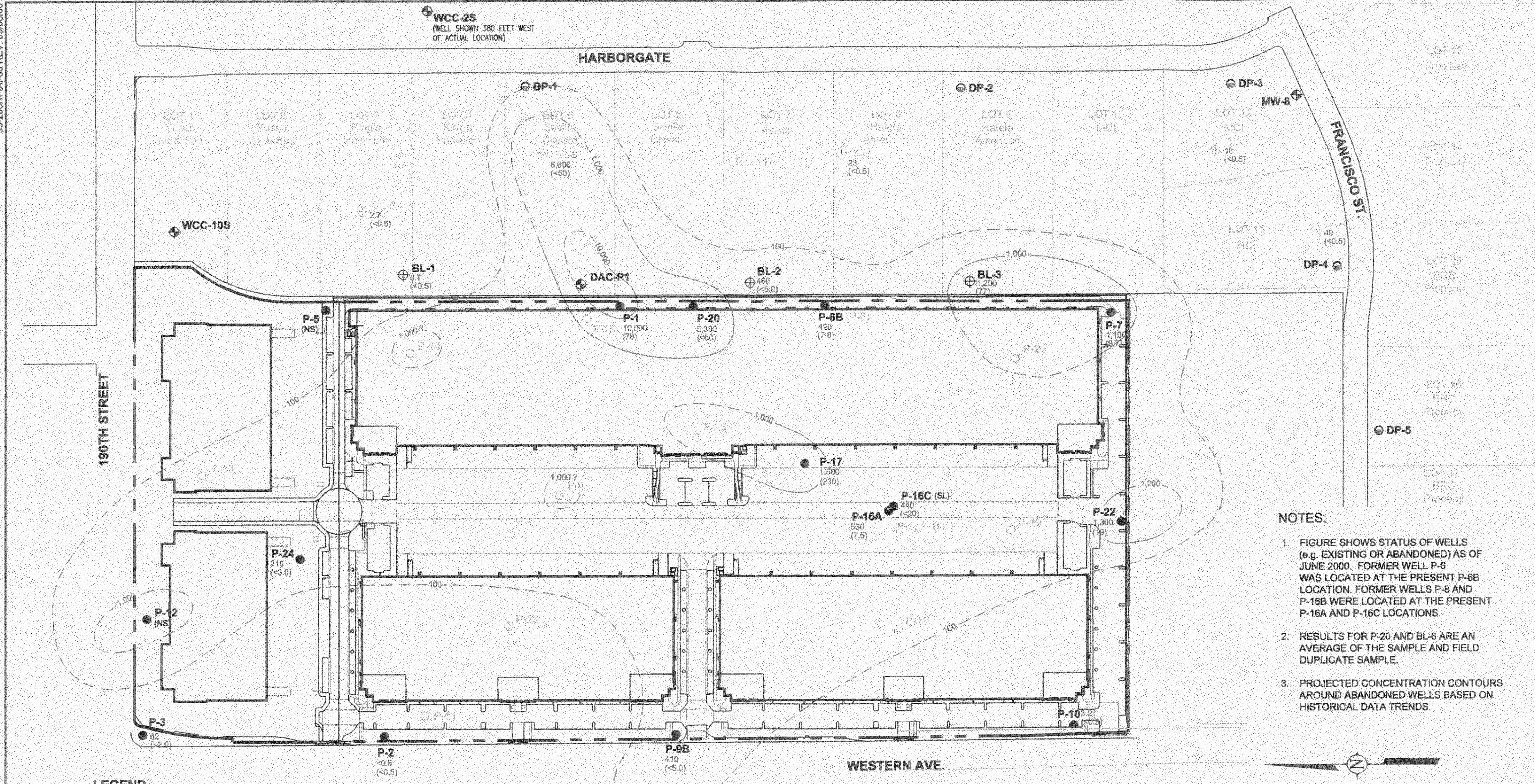
TRC

FIGURE 2.2

SOURCE: DRAFT GROUND WATER DATA ASSESSMENT REPORT, RCRA FACILITY INVESTIGATION, LMC. ILM FACILITY, TORRANCE, CA., MAY 7, 1996, FIG. 5.1.

99-200RFIAI REV. 7/17/00

BOE-C6-0106788




NOTES:

1. FIGURE SHOWS STATUS OF WELLS (e.g. EXISTING OR ABANDONED) AS OF JUNE 2000. FORMER WELL P-6 WAS LOCATED AT THE PRESENT P-6B LOCATION. FORMER WELLS P-8 AND P-16B WERE LOCATED AT THE PRESENT P-16A AND P-16C LOCATIONS.

2. RESULTS FOR P-20 AND BL-6 ARE AN AVERAGE OF THE SAMPLE AND FIELD DUPLICATE SAMPLE.

3. PROJECTED CONCENTRATION CONTOURS AROUND ABANDONED WELLS BASED ON HISTORICAL DATA TRENDS.

0 250 500 FEET

SCALE

**LEGEND**

FORMER ILM PROPERTY BOUNDARY

BUILDING LOCATION

P-1 EXISTING MONITORING WELLS ON FORMER ILM FACILITY

DP-1 PROPOSED LOCATION OF DIRECT PUSH PROBE POINTS

BL-1 INSTALLED IN FEBRUARY 1999) TEMPORARY OFFSITE GROUND WATER MONITORING WELLS ON BRC PROPERTY (WELLS

OTHER OFFSITE BRC PROPERTY GROUND WATER MONITORING WELLS

P-4 ABANDONED GROUND WATER MONITORING WELLS ON FORMER ILM FACILITY (WELLS ABANDONED IN 1996 AND 1997)

L-5 ABANDONED GROUND WATER MONITORING WELLS ON BRC PROPERTY (WELLS CLOSED IN JANUARY AND MAY 2000)

10,000 (78) JULY 1999 TCE AND PCE (IN PARENTHESIS) CONCENTRATIONS (ug/L)

100 TCE CONCENTRATION CONTOUR (ug/L) DASHED WHERE INFERRED

(NS) NOT SAMPLED. PETROLEUM HYDROCARBON SHEEN IN P-5; AND P-12 WAS DAMAGED

(SL) SLOTTED LOWER; DATA NOT UTILIZED

SOURCE: FREEMONT ASSOCIATES, INC. / HILL PINCKERT ARCHITECTS BUILDING PLAN, AUGUST 1999.

**PROPOSED LOCATIONS OF DIRECT PUSH SAMPLING POINTS AND TCE IN GROUND WATER**

**JULY 1999**

FORMER INTERNATIONAL LIGHT METALS FACILITY

TORRANCE, CALIFORNIA

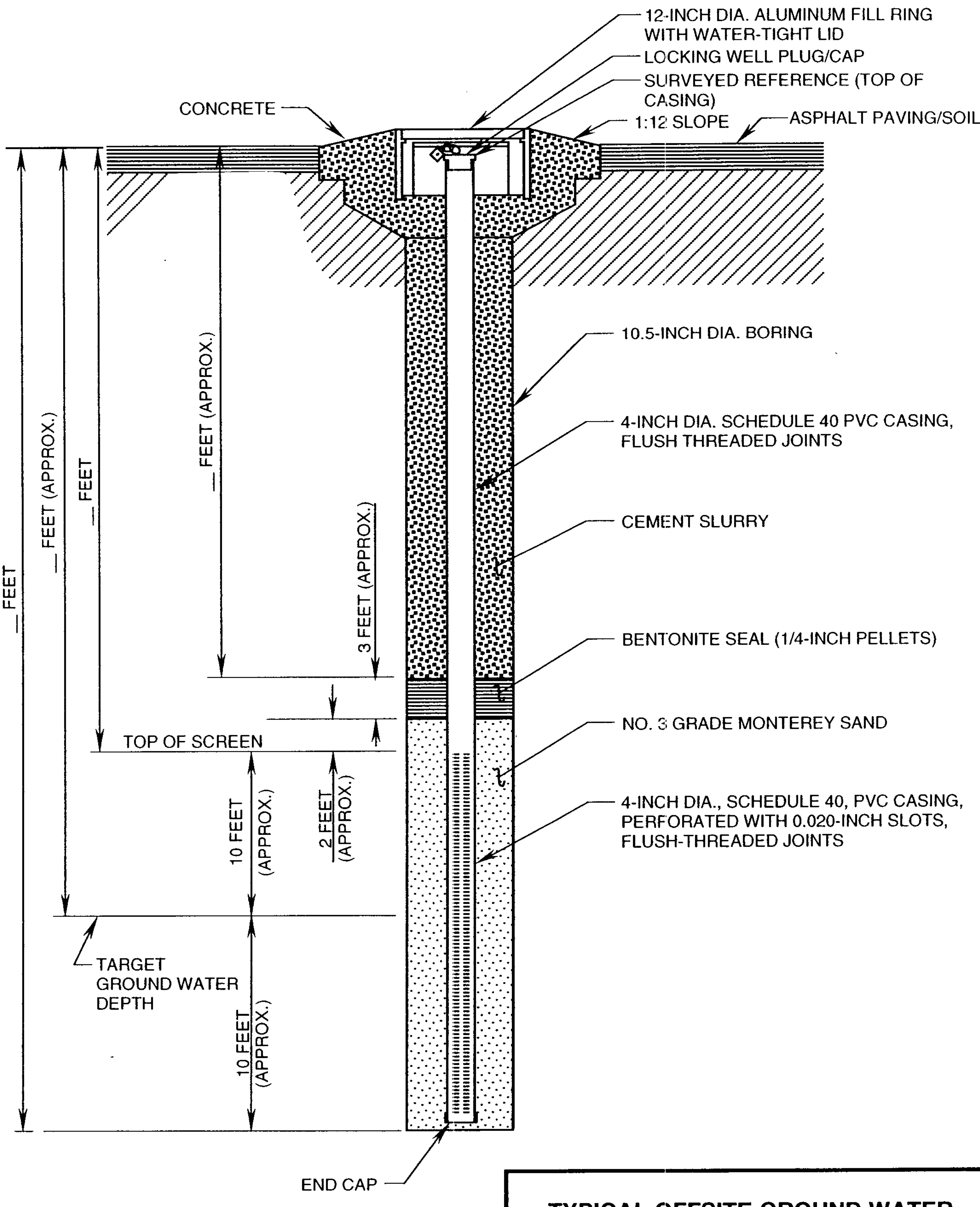
TRC

**FIGURE 3.1**

99-200RFIAI-03 REV. 09/08/00

BOE-C6-0106789

99-200RFIAI-02 REV. 09/11/00




NOTE: NOT TO SCALE

**TYPICAL OFFSITE GROUND WATER MONITORING WELL COMPLETION DIAGRAM**

INTERNATIONAL LIGHT METALS FACILITY
TORRANCE, CALIFORNIA

**TRC**

**FIGURE 3.2**

TRC
*Customer-Focused Solutions*

Printed on recycled paper